

What Is Claimed Is:

1. 1. A method of manufacturing a semiconductor device comprising:
 - forming a contact hole in an insulating layer;
 - filling the contact hole with a copper layer;
 - planarizing the copper layer;
 - removing a copper oxide layer parasitically formed on the copper layer;
 - depositing a copper barrier layer on the insulating layer and the copper layer;
 - depositing an upper insulating layer on the copper barrier layer; and
 - forming an upper contact hole in the copper barrier layer and the upper insulating layer to expose the copper layer.
2. A method as defined in claim 1, wherein removing the copper oxide layer exposes a surface of the copper layer and further comprising forming a copper nitride layer on the surface of the copper layer.
3. A method as defined in claim 2, wherein removing the copper oxide layer comprises performing a plasma process using at least one of ammonia gas and nitrogen gas.
4. A method as defined in claim 3, wherein the at least one of ammonia gas and nitrogen gas is introduced into a reaction chamber at a flow

rate of approximately 100 sccm to 200 sccm.

5. A method as defined in claim 4, wherein a temperature of the reaction chamber is maintained at approximately 300 to 500°C.

6. A method as defined in claim 3, wherein removing the copper oxide layer and depositing the copper barrier layer are conducted in the same reaction chamber.

7. A method as defined in claim 2, wherein removing the copper oxide layer comprises performing a heat treatment in an atmosphere of ammonia gas or nitrogen gas.

8. A method as defined in claim 7, wherein the atmosphere of ammonia gas or nitrogen gas is introduced into a furnace at a flow rate of approximately 5 to 20 slm.

9. A method as defined in claim 8, wherein a temperature of the furnace is maintained at approximately 400 to 600°C.

10. A method as defined in claim 2, wherein the copper nitride layer is deposited in a thickness of approximately 50 to 200 Å.

11. A method as defined in claim 1, wherein the copper barrier layer comprises a nitride layer.

12. A method as defined in claim 11, wherein the nitride layer is deposited in a thickness of approximately 50 to 200 Å.